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|---|---|
| Project No: | CRXC0062 |
| Project Name: | Bean Road Tunnel |

# BALFOUR BEATTY UK

# EMERGENCY PREPAREDNESS PLAN

**Rev 0.2**
**26TH JULY 2021**

**TABLE OF CONTENTS**

1. APPROVAL, DISTRIBUTION, MONITORING AND REVIEW....3
1.1 APPROVAL....3
1.2 DISTRIBUTION OF COMPLETED EMERGENCY PREPAREDNESS PLAN....3
1.3 RECORD OF REVIEW....3
2. PURPOSE OF DOCUMENT....4
2.1 ASSETS TO BE CONSIDERED....4
2.2 REFERENCED DOCUMENTS....6
3. PROJECT OVERVIEW....7
4. ROLES & RESPONSIBILITIES....8
4.1 COMMUNICATION & SITE CONTACTS....8
4.2 PROJECT ROLES & RESPONSIBILITIES....9
4.3 EMERGENCY RESPONSE TEAM PERSONNEL & CONTACT DETAILS....11
5. CONSTRUCTION METHODOLOGY AND SEQUENCE....12
5.1 PROGRAMME....12
5.2 METHODOLOGY....13
6. INCIDENT MANAGEMENT AND CONTROLS....15
6.1 GROUND MOVEMENT MONITORING....15
6.2 THAMES WATER PROCEDURE....17
6.3 WORKING WITH EMERGENCY SERVICES & STATUTORY UNDERTAKERS....18
6.4 EMERGENCY/INCIDENT CONTROL PROCEDURE....18
6.5 INCIDENT MANAGEMENT PROCEDURES....20
7. EMERGENCY PREPAREDNESS PLAN REVIEW PROCEDURE....22
7.1 TESTING PROCEDURE....22
7.2 REVIEW AND UPDATE POLICY....22

# 1. APPROVAL, DISTRIBUTION, MONITORING AND REVIEW

## 1.1 APPROVAL

| | Date | Signature |
|---|---|---|
| **Prepared By (Project Lead)** | | |
| **Approved by (Project Sponsor)** | | |
| **Approved by** *(Insert others as required)* | | |
| | | |
| | | |

## 1.2 DISTRIBUTION OF COMPLETED EMERGENCY PREPAREDNESS PLAN

| Copy No. | Name | Position | Location |
|---|---|---|---|
| 1 | Nigel Loraine | Project Lead | Site Office |
| 2 | Anne Connolly | Project Sponsor | 5 Churchill Place, Canary Wharf, London, E14 5HU |
| 3 | Kent County Council | Customer | Property and Infrastructure Support, Sessions House, County Road, Maidstone, Kent, ME141XQ |
| 4 | Graham Killick | Customers Agent/Representative (if applicable) | Property and Infrastructure Support, Sessions House, County Road, Maidstone, Kent, ME141XQ |
| 5 | | *Insert others as required* | |

## 1.3 RECORD OF REVIEW

| Date | Rev No. | Details of Review | By Whom | Action Taken | Signed |
|---|---|---|---|---|---|
| 21/07/2021 | 0.1 | Update following comments from Thames Water | Rob White | Abstract from Construction Programme added to 5.1 Programme<br>Contingency Measures added to 6.1 Ground Movement Monitoring | |
| 26/07/2021 | 0.2 | Final review following comments from Thames Water | Bradley Clarke | Various updates to address TW & Paige Solutions comments | [redacted] |
| | | | | | |
| | | | | | |
| | | | | | |

## 2. PURPOSE OF DOCUMENT

The purpose of this Emergency Preparedness Plan (EPP) is to record and outline the controls and procedures that are in place to ensure all reasonably practicable measures have been taken to protect the people, the works, the public and associated third party assets in the event of an emergency during the construction phase of the Bean Road Tunnel (BRT) project.

The mitigation of construction risks is considered during design and construction stages and are identified and managed through the documented risk assessment and method statement processes. This EPP outlines the emergency scenarios considered and the actions to be taken after an unplanned event has occurred to ensure the health and safety of our employees, sub-contractors, any third-party personnel, the public and any assets within the footprint of the BRT project.

This document fulfils the requirement of Thames Water 'Letter of No Further Comment' and contributes to the closure of Planning Constraint Number 16, namely –

*"Prior to commencement of construction taking place, details shall be submitted to the County Planning Authority to satisfactorily demonstrate the diversion of Thames Water assets to prevent the potential for damage to subsurface potable water infrastructure; and no construction shall take place within 5m of the Thames Water water main other than in accordance with an approved method statement for the works including details of how the asset can be diverted or the development works can be aligned so as to prevent the potential for damage to subsurface potable water infrastructure. The development shall only be carried out in accordance with the approved details".*

Further to the above, this EPP will outline the procedures and controls required to comply with the following standards:

- BS EN 6164:2019 – Health and Safety in Tunnelling in the Construction Industry. Code of Practice
- Fire and Rescue Service Operational Guidance (2012)
- The Construction (Design and Management) Regulations 2015

### 2.1 ASSETS TO BE CONSIDERED

A number of third party and statutory assets are present within the footprint of the BRT project and are considered within this EPP. The affected assets are set out below and in Figure 2.a & 2.b.

- 1no. high voltage (HV) electric Cable/Line – 33kV **(UKPN)**
- 1no foul sewer – disused
- 1no. 225mm dia. vitrified clay sewer **(TW)**
- 1no. 450mm dia. ductile iron clean water pipe **(TW)**
- 1no. 315mm dia. molecular oriented PVC (PVC-O) pipe **(TW)**
- 1no. 800mm dia. ductile iron clean water pipe **(TW)**
- 2no. 355mm dia. black polyethylene (MDPE) pipes **(TW)**
- 1no. 315mm dia. polyethylene (PE) medium pressure (M/P) gas pipe **(SGN)**

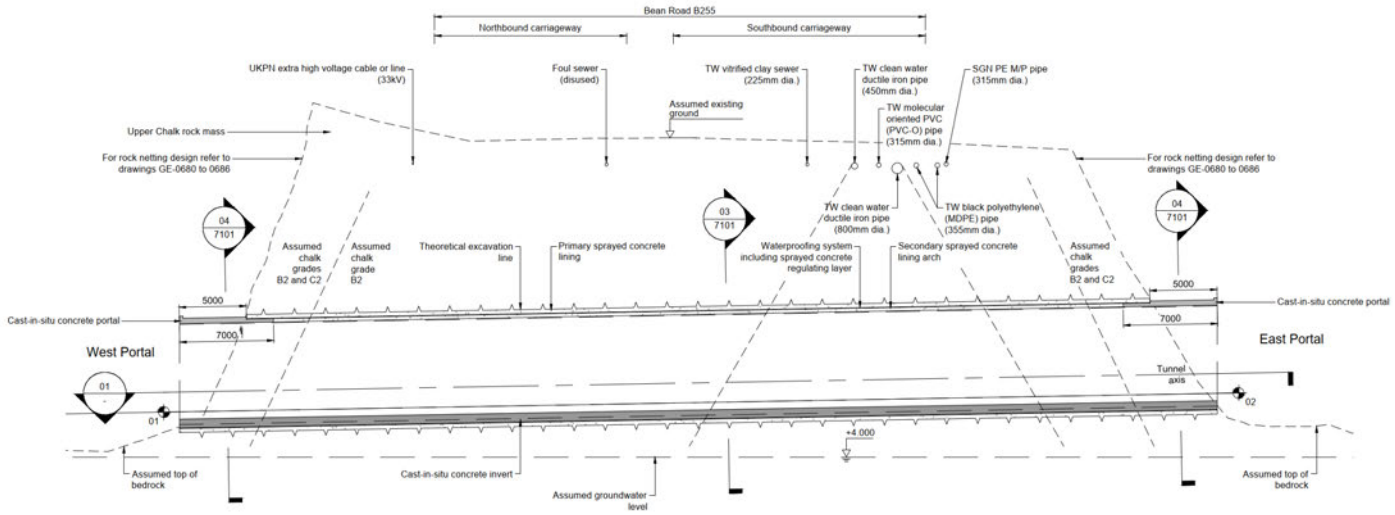
Bean Road B255
Northbound carriageway
Southbound carriageway
UKPN extra high voltage cable or line (33kV)
Foul sewer (disused)
TW vitrified clay sewer (225mm dia.)
TW clean water ductile iron pipe (450mm dia.)
SGN PE M/P pipe (315mm dia.)
Assumed existing ground
TW molecular oriented PVC (PVC-O) pipe (315mm dia.)
Upper Chalk rock mass
For rock netting design refer to drawings GE-0680 to 0686
TW clean water ductile iron pipe (800mm dia.)
TW black polyethylene (MDPE) pipe (355mm dia.)
Assumed chalk grades B2 and C2
Assumed chalk grade B2
Theoretical excavation line
Primary sprayed concrete lining
Waterproofing system including sprayed concrete regulating layer
Secondary sprayed concrete lining arch
Cast-in-situ concrete portal
West Portal
East Portal
Tunnel axis
Assumed top of bedrock
Cast-in-situ concrete invert
Assumed groundwater level
+4.000
5000
7000

***Figure 2.b: Extract from drawing BRT-TG-XX-TU-DR-TU-7100 illustrating existing statutory undertaker assets within footprint of tunnel construction***

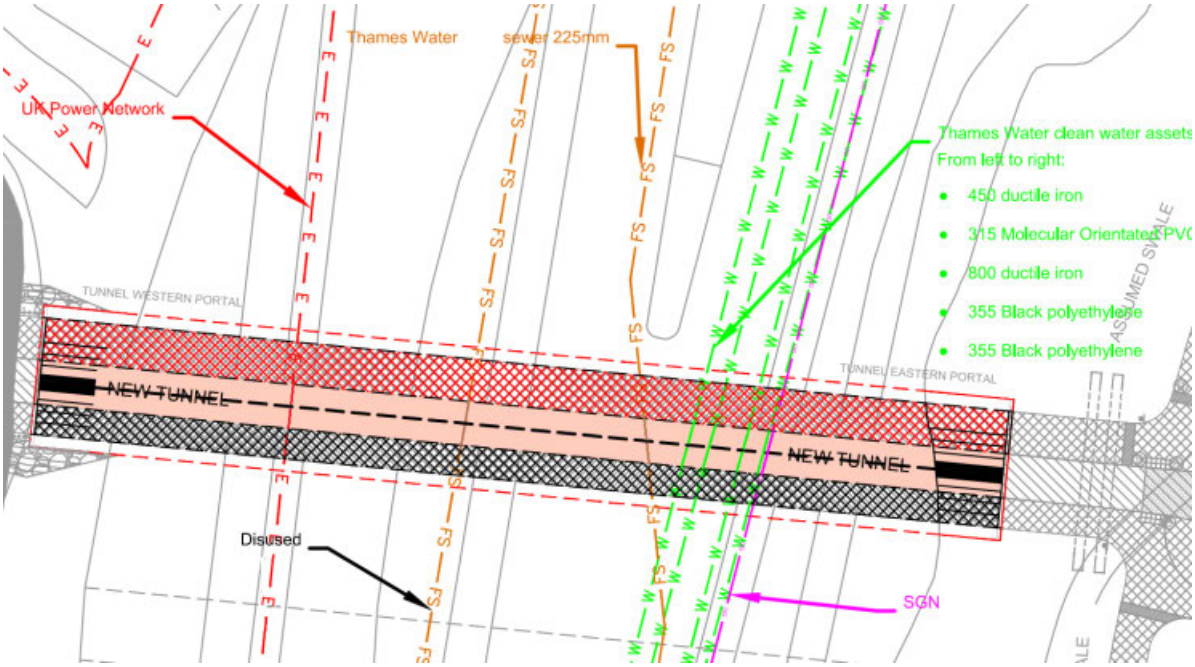


***Figure 2.a: Extract from BRT-TG-XX-TU-RP-TU-7001 showing plan alignment of existing utilities within footprint of tunnel construction***

**NOTE – Exact location of 225mm dia. TW vitrified clay sewer above is to be positively identified and recorded through trial holes before tunneling works commence.**

### 2.2 REFERENCED DOCUMENTS

This EPP considers procedures, controls and recommendations included across several documents as outlined below:

| Document Reference | Document Title | Document Author |
|---|---|---|
| PMR-TF-0001b | Construction Phase Plan | Balfour Beatty |
| N/A | Construction Environmental Management Plan | Balfour Beatty |
| N/A | Tunnel Specific Fire Risk Assessment | Balfour Beatty |
| BRT-TG-XX-TU-RP-TU-7004 | Bean Tunnel – Specification for Tunnelling | Tony Gee & Partners |
| N/A | Project and Site-Specific Inductions | Balfour Beatty |
| HSES-TF-00026a | Project Training Matrix & Responsibilities Matrix | Balfour Beatty |
| HSES-TF-0003a | Emergency Response Matrix & Assessment | Balfour Beatty |
| BRT-TG-XX-TU-RP-TU-7001 | Ground Movement Analysis & Engineering Impact Report | Tony Gee & Partners |
| NA | Site Layout Plans | Balfour Beatty |
| N/A | Sprayed Concrete Bean Road Tunnel. Risk Assessment & Method Statement | Shotcrete |
| BRT-TG-XX-TU-DR-TU-7000 to 7600 | Bean Tunnel – Tunnel and Highway Detailed Design | Tony Gee & Partners |
| 0421-GTC-001 | Trial Hole One | GTC/Subsite |

## 3. PROJECT OVERVIEW

The works are for a new tunnel of 70m in length through the chalk spine under the B255 Bean Road between Bluewater Shopping Centre and the Eastern Quarry site, serving to directly connect the shopping centre to the new Eastern Quarry development and Ebbsfleet International Railway Station. It will form part of the Fastrack bus rapid transit system within Kent Thameside and drive forward to accomplish the theme of Modal Share of non-car modes within the Fastrack network.

The tunnel will house a 3.5m wide single way Fastrack Busway linking Eastern Quarry and Bluewater, as well as providing a pedestrian footway and shared footway/cycleway linking the Eastern Quarry and Bluewater as part of the Ebbsfleet Garden City green corridor network.

The single lane, bi-directional bus lane will be controlled by a traffic signal system. The shared footway/cycleway is located on the northern side of the tunnel, with the pedestrian footway to the south. Included with the traffic signal system, one controlled crossing will be constructed on Bluewater Parkway and there will be an uncontrolled crossing at the east portal of the tunnel. The bus lane will turn left only into Bluewater Parkway to access Bluewater bus station. The route to the new development in Eastern Quarry from Bluewater bus station is designed as a controlled turn right into the tunnel from a dedicated bus lane. An additional traffic lane will be formed in the western verge of northbound carriageway of Bluewater Parkway to maintain two lanes of regular traffic in both directions around the peripheral highway network.

An embankment will be constructed for the new road over the existing reed bed and flood lagoon. In compensation, the existing lagoon will be extended to the north to provide the same capacity as existing. A piped culvert is tabled as the connector between the existing lagoon and the extended area.

The works area within the Bluewater Shopping complex is currently woodland and shrubs with an ecological element that will be sympathetically managed for trees, shrubs, and wildlife so there is minimal damage or long-term effects. As part of the proposal for the tunnel, new trees will be planted within the western side and at strategic locations around the Bluewater Park. Further ecology considerations are required for an existing bat colony and it is the intention to retain the existing south haulage tunnel as a bat refuge. All these measures will leave a lasting legacy.

An early works enabling package will be delivered to ensure the safety of those working in or around the new tunnelling works. The scope of these works will include de-vegetation and rock stabilisation of the chalk cliff faces. Access will be from high level on the B255 which will require traffic management to be in place. A specialist high level access supplier will be utilised to provide safe access down the cliff face when installing the rock stabilisation system.

## 4. ROLES & RESPONSIBILITIES

### 4.1 COMMUNICATION & SITE CONTACTS

| Organisation | Job Title | Name | Contact Details |
|---|---|---|---|
| Balfour Beatty | Portfolio Director | Anne Connolly | [redacted] |
| Balfour Beatty | Senior Project Manager | Nigel Loraine | |
| Balfour Beatty | Package Manager (Agent) | Liam Smith | |
| Balfour Beatty | HSE Advisor | Mick Stallard | |
| Balfour Beatty | Environment & Sustainability Manager | Emma Eves | |
| Balfour Beatty | Works Manager | Joe Lewis | |
| Balfour Beatty | General Foreman (Evening Ops) | TBC | TBC |
| Balfour Beatty | Works Manager (Night Ops) | TBC | TBC |
| Kent County Council | Major Capital Programme Project Manager | Graham Killick | [redacted] |
| Thames Water | Developer Services Major Projects | Alex Birgauan | Alex.Birgauan@thameswater.co.uk |
| Thames Water | Asset Protection – Civil Engineer | Michaela Chan | micheala.chan@arcadis.com |
| Thames Water | 24hr Service Number | N/A | 0800 316 9800 |
| Thames Water | Waste Operational Control Centre | N/A | 0800 009 3908 |
| Thames Water | Clean Water Network Management Centre | N/A | 0800 009 3909 |
| UKPN | Diversions Engineer | Mwelwa Chilbwe | Mwelwa.chibwe@ukpowernetworks.co.uk |
| SGN | Plant Protection Officer | Johnathan Taylor | [redacted] |
| Bluewater | TBC | TBC | TBC |
| Virgin Media | Access Planner | Daniel Barrier | [redacted] |
| BT Openreach | Network Rearrangement Complex | Robert Turpie | [redacted] |
| **Others to be added as required* | | | |

## 4.2 PROJECT ROLES & RESPONSIBILITIES

Specific site roles have been defined to guarantee the project is appropriately resourced at all times and to ensure the controls and procedures outlined within this EPP and associated health and safety documentation are adhered to, and respective action plans are implemented in the event of an emergency. **Note that one individual may fulfil more than one specific role as defined below.*

### 4.2.1 PROJECT MANAGER

The project manager holds overall responsibility for health and safety on the project and will ensure:

- A suitable emergency plan is developed and briefed to all personnel involved within the construction works.
- Provide adequate resources (both time and money) to ensure the emergency plan is effective and achievable.
- The approved emergency plan is practiced, and any learnings recorded and implemented.

### 4.2.2 TUNNELS MANAGER / TUNNELS AGENT

Then Tunnels Manager/Agent will nominate a responsible person to assume responsibility of site Main Incident Controller (Note – site rota to be maintained). This person will usually be the Senior Shift Engineer or Tunnel Foreman. In the unlikely event they cannot be contacted or fulfil their role at the time of the incident or emergency, the most senior person present will assume control.

The Tunnel Manager/Agent is not required to be permanently on site or 'on construction' but will ensure their mobile phone is on their person and working where practical. If the Tunnel Manager/Agent knows they will not be in a position to carry out the role, it is their responsibility to arrange a change with another manager on the rota and to notify the Duty Manager accordingly.

### 4.2.3 MAIN INCIDENT CONTROLLER (MIC)

The MIC is responsible for:

- Contacting and coordinating with the emergency services as required.
- Informing the Tunnel Manager/Agent and Works Manager as soon as possible following an incident, who will then inform the project Emergency Coordinator in line with the Emergency Response Plan
- Establishing communications at the emergency site area.
- Establishing the facts and keeping note of proceedings as the emergency progresses or appointing a suitable person to do so.
- Confirming that the correct emergency services have been engaged.
- Considering what level of site evacuation is required, and then implementing this procedure.
- Considering the strategic picture (i.e. deliveries, access, emergency service support, and access/egress routes).

### 4.2.4 PERSON IN CHARGE (PIC)

The PIC is the most senior person underground at the location of the incident (either the Lead Miner, or Engineer). If an incident occurs, they will:

- Take control of the situation.
- Ensure the safety of those under their control.
- Inform the MIC by the quickest means possible and update them as the incident progresses, using tunnel leaky feeder or telephone.

- Evacuate the area if required and ensure those under their control go to the nearest assembly point, ensuring that nobody is put at further risk.
- Account for all gang members at the assembly point.

#### 4.2.5 APPOINTED FIRST AID PERSONNEL

Appointed first aid personnel will be trained to the full three-day course standard and will be required to attend any person and apply their training to the best of their ability given the circumstances at the time. They will be required to maintain their skill level to enable them to carry out the duties of the first aider. Where required, Oxygen and Defibrillator trained personnel are to be made available.

#### 4.2.6 PROJECT EMERGENCY RESPONSE TEAM

Site personnel with particular or specialist skills will be selected to form the Emergency Response Team (ERT). Rescue training will comprise a two-day course provided by Mines Rescue Training Limited.

The number of persons, their mix of skills and distribution across site may be varied from time to time by the Tunnel Manager/Agent to suit the risks prevailing at the time. Typical skills required for the ERT include experience of the tunnelling methodology and:

- First Aid at Work (Selected Members)
- Use of defibrillator and oxygen administration (as required)
- Entonox administration (as required)
- Use of fire extinguisher and firefighting equipment
- Emergency rescue arrangements, roles, responsibilities dynamic risk assessment and communication
- Emergency first aid, use of stretchers and lifting equipment
- Other training as required

In accordance with BS EN 6164:2019, Paragraph 4.2, every 3 months the Project Manager, Construction Manager, Tunnel Manager/Agent, Works Superintendent, HSE Manager, and others as required (at Project Managers discretion) will carry out a risk assessment review to determine in which situations the ERT will be required to attend. The Tunnel Manager/Agent will set up or amend the ERT to suit the site requirements as determined in this review.

The members of the ERT will be released from their normal duties for sufficient time to receive adequate training and briefing. A minimum of one training exercise will be carried out every three months, appropriate to one of the risk areas identified.

At least once every three months the Project Manager and Tunnel Manager/Agent will review the Rescue systems.

The Tunnels HSEQ Manager will prepare a short report in time for each emergency risk assessment review.

### 4.3 EMERGENCY RESPONSE TEAM PERSONNEL & CONTACT DETAILS

| Name | Organisation | Contact Details | ERT Role & Responsibilities |
|---|---|---|---|
| **To be populated and updated as required during construction* | | | |
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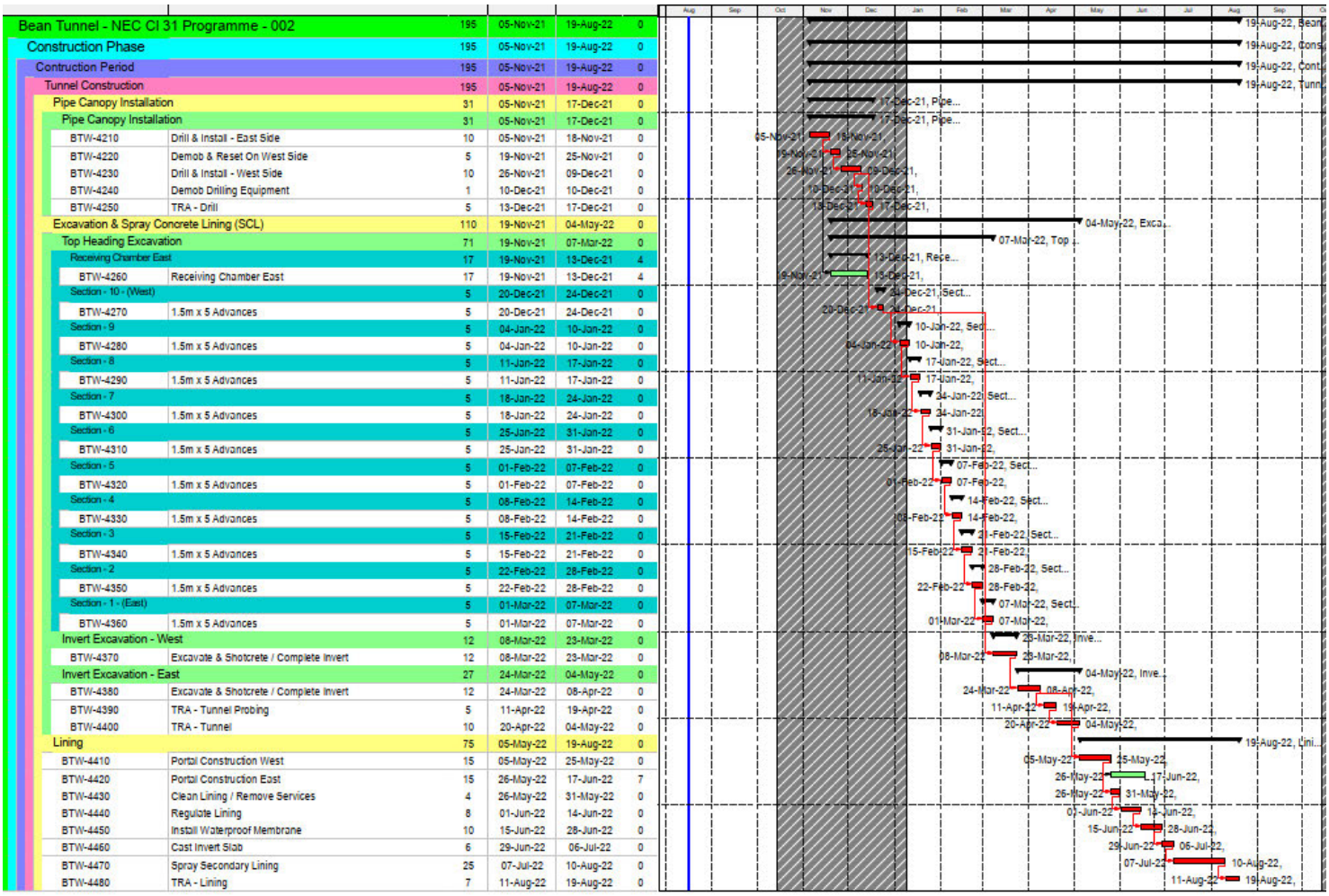
## 5. CONSTRUCTION METHODOLOGY AND SEQUENCE

### 5.1 PROGRAMME

The tunnelling activities are scheduled to be undertaken between November 2021 and August 2022, as shown below in Figure 5.a.



| | | | | | |
|---|---|---|---|---|---|
| Bean Tunnel - NEC Cl 31 Programme - 002 | | 195 | 05-Nov-21 | 19-Aug-22 | 0 |
| Construction Phase | | 195 | 05-Nov-21 | 19-Aug-22 | 0 |
| Contruction Period | | 195 | 05-Nov-21 | 19-Aug-22 | 0 |
| Tunnel Construction | | 195 | 05-Nov-21 | 19-Aug-22 | 0 |
| Pipe Canopy Installation | | 31 | 05-Nov-21 | 17-Dec-21 | 0 |
| Pipe Canopy Installation | | 31 | 05-Nov-21 | 17-Dec-21 | 0 |
| BTW-4210 | Drill & Install - East Side | 10 | 05-Nov-21 | 18-Nov-21 | 0 |
| BTW-4220 | Demob & Reset On West Side | 5 | 19-Nov-21 | 25-Nov-21 | 0 |
| BTW-4230 | Drill & Install - West Side | 10 | 26-Nov-21 | 09-Dec-21 | 0 |
| BTW-4240 | Demob Drilling Equipment | 1 | 10-Dec-21 | 10-Dec-21 | 0 |
| BTW-4250 | TRA - Drill | 5 | 13-Dec-21 | 17-Dec-21 | 0 |
| Excavation & Spray Concrete Lining (SCL) | | 110 | 19-Nov-21 | 04-May-22 | 0 |
| Top Heading Excavation | | 71 | 19-Nov-21 | 07-Mar-22 | 0 |
| Receiving Chamber East | | 17 | 19-Nov-21 | 13-Dec-21 | 4 |
| BTW-4260 | Receiving Chamber East | 17 | 19-Nov-21 | 13-Dec-21 | 4 |
| Section - 10 - (West) | | 5 | 20-Dec-21 | 24-Dec-21 | 0 |
| BTW-4270 | 1.5m x 5 Advances | 5 | 20-Dec-21 | 24-Dec-21 | 0 |
| Section - 9 | | 5 | 04-Jan-22 | 10-Jan-22 | 0 |
| BTW-4280 | 1.5m x 5 Advances | 5 | 04-Jan-22 | 10-Jan-22 | 0 |
| Section - 8 | | 5 | 11-Jan-22 | 17-Jan-22 | 0 |
| BTW-4290 | 1.5m x 5 Advances | 5 | 11-Jan-22 | 17-Jan-22 | 0 |
| Section - 7 | | 5 | 18-Jan-22 | 24-Jan-22 | 0 |
| BTW-4300 | 1.5m x 5 Advances | 5 | 18-Jan-22 | 24-Jan-22 | 0 |
| Section - 6 | | 5 | 25-Jan-22 | 31-Jan-22 | 0 |
| BTW-4310 | 1.5m x 5 Advances | 5 | 25-Jan-22 | 31-Jan-22 | 0 |
| Section - 5 | | 5 | 01-Feb-22 | 07-Feb-22 | 0 |
| BTW-4320 | 1.5m x 5 Advances | 5 | 01-Feb-22 | 07-Feb-22 | 0 |
| Section - 4 | | 5 | 08-Feb-22 | 14-Feb-22 | 0 |
| BTW-4330 | 1.5m x 5 Advances | 5 | 08-Feb-22 | 14-Feb-22 | 0 |
| Section - 3 | | 5 | 15-Feb-22 | 21-Feb-22 | 0 |
| BTW-4340 | 1.5m x 5 Advances | 5 | 15-Feb-22 | 21-Feb-22 | 0 |
| Section - 2 | | 5 | 22-Feb-22 | 28-Feb-22 | 0 |
| BTW-4350 | 1.5m x 5 Advances | 5 | 22-Feb-22 | 28-Feb-22 | 0 |
| Section - 1 - (East) | | 5 | 01-Mar-22 | 07-Mar-22 | 0 |
| BTW-4360 | 1.5m x 5 Advances | 5 | 01-Mar-22 | 07-Mar-22 | 0 |
| Invert Excavation - West | | 12 | 08-Mar-22 | 23-Mar-22 | 0 |
| BTW-4370 | Excavate & Shotcrete / Complete Invert | 12 | 08-Mar-22 | 23-Mar-22 | 0 |
| Invert Excavation - East | | 27 | 24-Mar-22 | 04-May-22 | 0 |
| BTW-4380 | Excavate & Shotcrete / Complete Invert | 12 | 24-Mar-22 | 08-Apr-22 | 0 |
| BTW-4390 | TRA - Tunnel Probing | 5 | 11-Apr-22 | 19-Apr-22 | 0 |
| BTW-4400 | TRA - Tunnel | 10 | 20-Apr-22 | 04-May-22 | 0 |
| Lining | | 75 | 05-May-22 | 19-Aug-22 | 0 |
| BTW-4410 | Portal Construction West | 15 | 05-May-22 | 25-May-22 | 0 |
| BTW-4420 | Portal Construction East | 15 | 26-May-22 | 17-Jun-22 | 7 |
| BTW-4430 | Clean Lining / Remove Services | 4 | 26-May-22 | 31-May-22 | 0 |
| BTW-4440 | Regulate Lining | 8 | 01-Jun-22 | 14-Jun-22 | 0 |
| BTW-4450 | Install Waterproof Membrane | 10 | 15-Jun-22 | 28-Jun-22 | 0 |
| BTW-4460 | Cast Invert Slab | 6 | 29-Jun-22 | 06-Jul-22 | 0 |
| BTW-4470 | Spray Secondary Lining | 25 | 07-Jul-22 | 10-Aug-22 | 0 |
| BTW-4480 | TRA - Lining | 7 | 11-Aug-22 | 19-Aug-22 | 0 |

***Figure 5.a: Extract from Construction Programme for Tunnelling Works***

The works will proceed in the following key phases:

1. Establish ground movement data for a period of no less than two months prior to commencement of any tunnelling activities to set 'Base Line' for monitoring movement as the project proceeds
2. Tunnelling sub-contractor mobilisation to site
3. Undertake site inductions
4. Set up site compound and batching plant at East Portal
5. Set up site compound at West Portal
6. Commission batching plant
7. **HOLD POINT –** Sprayed Concrete Lining (SCL) mix design to be proven with sample testing
8. Install steel pipe arch to secure portals; West Portal followed by East portal
9. Excavate and spray primary lining to top heading advances
10. Excavate and spray primary lining to temporary backfill to invert advances
11. Remove temporary backfill
12. Clean primary lining

13. Apply waterproofing layer
14. Spray secondary lining
15. Construct in-situ portals
16. Demobilise and clear site

### 5.2 METHODOLOGY

The Bean Road Tunnel will be constructed in two stages, with an excavation and three-layered spraying operation for each advance. Detailed descriptions of the construction methodology are provided in the specific tunnelling method statement reference in Section 2.2.

**Stage 1:** The top heading will be excavated, and primary lining sprayed over the full length in 1m and 1.5m advances. The first stage will commence from the West Portal side as shown in Figure 5-b.

Dimensions are detailed in the contract drawings outlined in Section 2.2 of this document. Although both stages are at different angles, the basic construction sequence, toolbox contingency measures and construction techniques are the same for both excavation directions, including the lining thicknesses.

**Stage 2:** The invert will be excavated and sprayed over the full length in 2m and 3m advances. The invert will be excavated from the East Portal side, as shown in Figure 5.b. Once each advance has been sprayed, the tunnel will be backfilled to the highway crown reference line to allow for access to the face and excavation of the next advance.

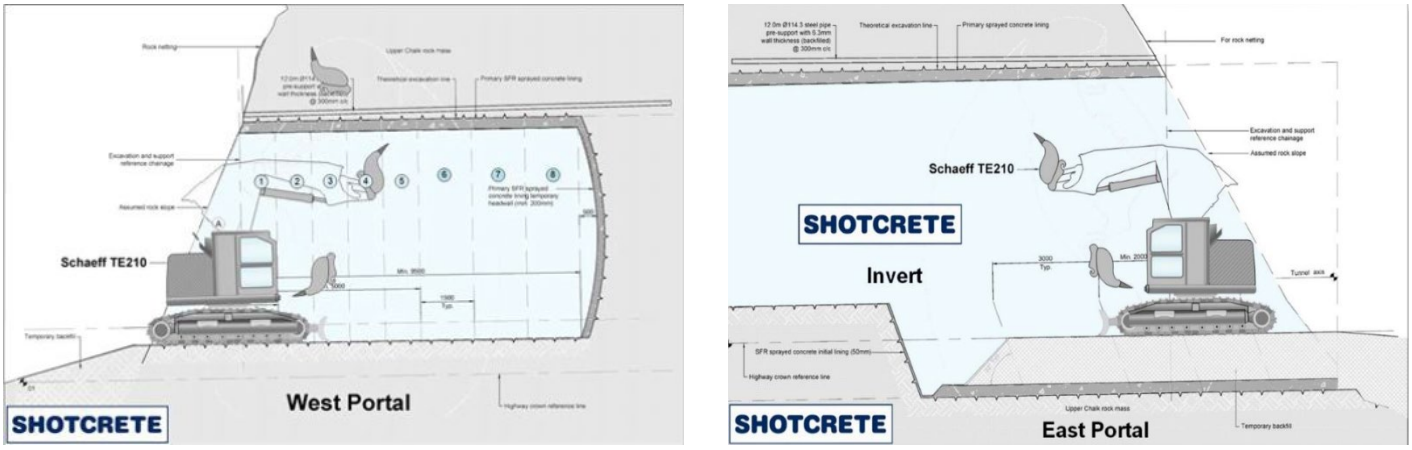



***Figure 5.b: Extract from Sprayed Concrete Bean Road Tunnel RAMS illustrating excavation of top heading (Left) and invert (Right)***

The sprayed concrete lining will consist of a 300mm thick Steel Fibre Reinforced Shotcrete (SFRS) lining per advance, followed by a waterproofing layer and 300mm thick secondary lining. The sealing layer consist of steel reinforced sprayed concrete, sprayed at a high accelerator dosage. This will only be installed if water is present or in areas of geological overbreak which require building out prior to the completion of the structural lining. The layer is sprayed on to the newly excavated ground to seal the excavation and provide early support for the personnel working at or near the tunnel face. This layer is sacrificial and can therefore be applied at accelerator dose rates above 10% if required to enable the containment of water ingress. The tunnel will be over excavated from the design line by 100mm to accommodate this layer. The primary lining consists of 300mm thick SFRS which is built up in three passes of the spray nozzle.

Once the required excavated profile has been achieved, the excavator will be moved back from the face and the spraying machine positioned at the face. An exclusion zone will be maintained at all times to

prevent access under the unsupported heading. The spraying robot will then apply a 50mm sealing coat and fill any overbreak. If no toolbox measures are required, the Steel Fibre Reinforced Sprayed Concrete Lining (SFRSCL) will be applied in 3no. 100mm layers.

On completion of the primary lining an early age test panel will be sprayed to enable the shotcrete strength to be measured by the SCL Engineer. Once a strength of 0.5MPa has been achieved the exclusion zone can be removed.

NOTE: During the application of the shotcrete, the Engineer will be in radio communication with the Nozzleman to ensure the correct thickness is achieved.

The complete methodology for the construction of the tunnel top heading and invert is included within the Shotcrete ‘Sprayed Concrete Bean Road Tunnel. Risk Assessment & Method Statement’.

## 6. INCIDENT MANAGEMENT AND CONTROLS

Throughout the construction of the tunnel Balfour Beatty will employ the following incident management procedures and controls to protect our people, subcontractors, the public, third parties and affected assets.

### 6.1 GROUND MOVEMENT MONITORING

Throughout the duration of the tunnelling works, ground movement will be surveyed and monitored to ensure it does not exceed permissible limits which could cause damage to assets, or impact upon the safety of those undertaking the works.

Prior to undertaking any works, a survey of ground movement will be undertaken at existing ground level to establish a baseline from which to measure movement during the tunnelling works. Levelling bolts will be installed on the B255 Bean Road, in accordance with drawing BRT-TG-XX-TU-DR-TU-7401, see Figure 6.a. Monitoring will be undertaken for a minimum period of two months before construction starts, to establish a baseline. During the works, ground movement surveys will continue with the data compared to the baseline level to determine the actual ground movement. If ground movement exceeds the pre-set trigger points which could impact the affected assets, we will contact the relevant Statutory Undertaker in good time to advise of the movement. The ground array will remain in place for a period of three months after construction to record any post-construction ground movement.

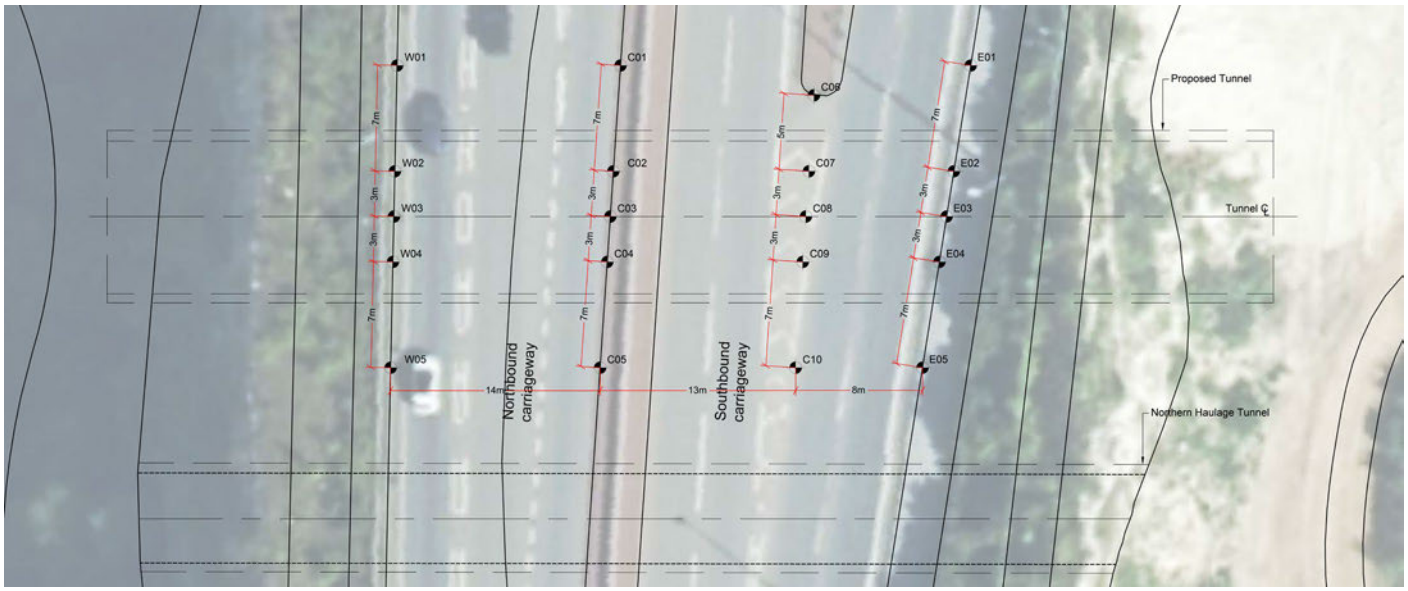



***Figure 6.a: Plan view of B255 Bean Road ground monitoring points***

Similarly, as tunnelling works progress ground movement monitoring points will be installed within the tunnel to monitor ground movement internally. Monitoring points will be installed in accordance with drawing BRT-TG-XX-TU-DR-TU-7400, see Figure 6-b. 5no. monitoring points and 3no. temporary headwalls will be installed per array, spaced at 10m intervals. The installation of monitoring targets will be conducted at different position with the progress of the excavation and when the works do not interfere or put in danger the integrity of the monitoring points, or readings from the monitoring. After installation, protective steel boxes will be installed around the monitoring points to protect them from tunnelling activities.

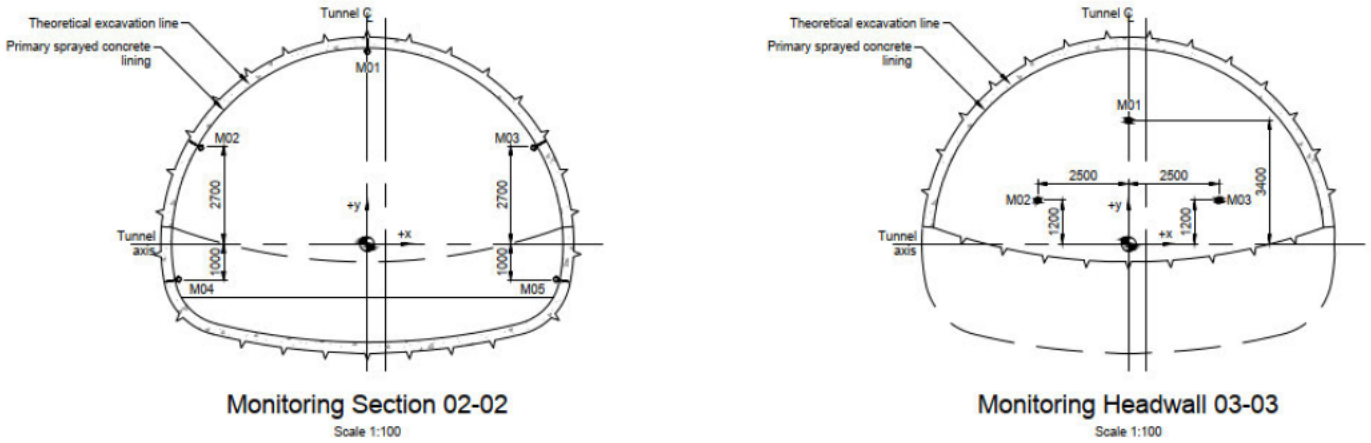



***Figure 6.b: Section view showing ground movement monitoring points within tunnel section (Left) and headwall (Right)***

All monitoring points will be surveyed daily and compared to the baseline reading to show daily ground movement. Ground movement readings will be presented and discussed at the Daily Review Meeting (DRM), where further actions can be implemented if any significant change or breach of set trigger levels is noted. If ground movement data shows that a trigger level has been breached, the progress of works will be discussed and relevant Statutory Undertaker informed, where required, to discuss the ground movement and required actions.

If **AMBER** trigger level is breached: Relevant Statutory Undertakers are to be informed of the breach and mitigation action shared.

If **RED** trigger level is breached: Emergency contacts for relevant Statutory Undertakers are to be contacted immediately and mitigation action shared.

If the **BLACK** trigger level is breached or is anticipated to be exceeded: Further tunnelling works will be stopped immediately, and treatments provided as noted below. The team will then convene to assess the ground movement data and determine what additional measures are required (i.e. road closure, compensatory grouting, etc.) to protect all assets within the vicinity. The appointed person will also contact the emergency contact at relevant Statutory Undertakers as soon as possible.

| Monitoring Point | Trigger Value (mm) | | |
|---|---|---|---|
| | Amber | Red | Black |
| Bean Road Surface | 4 | 8 | 12 |
| Section – M01 | 5 | 10 | 20 |
| Section – M02 | 5 | 10 | 15 |
| Section – M03 | 5 | 10 | 15 |
| Section – M04 | 5 | 10 | 15 |
| Section – M05 | 5 | 10 | 15 |
| Headwall – M01 | 5 | 10 | 15 |
| Headwall – M02 | 5 | 10 | 15 |
| Headwall – M03 | 5 | 10 | 15 |

Contingency measures shall be implemented according to the Design and encountered ground conditions as agreed at the DRM. Contingency measures include, but are not limited to:

- Pocket Excavation and Face Wedge Support
- Additional Sprayed Concrete.
- Probe Drilling
- Shortening the advance length
- Spiling
- Employment of the Safe Stop Procedure

The DRM shall consider the necessity for extra contingency measures. Where a measure must be applied urgently at the face then the Contractor or his delegate will be responsible for making this decision and this will be followed up and documented at the DRM.

**Safe Stop Monitoring**

In the event that tunnelling works needs to stop for safety reasons, all exposed faces of the excavation will be sprayed with a minimum of 50mm thick SFRS. If the planned stoppage is expected to be longer than 24hrs, the Required Excavation Support Sheet (RESS) or DRM will advise of any additional support measures required:

- Short Term Stoppage (From 24h to 72h): The headwall thickness will be increased to 250mm and weep holes will be drilled as per design
- Long Term Stoppage (>72h): The DRM needs to assess the environment at the time of the stoppage and may instruct an increased thickness, fibre glass dowels, or other toolbox items as required.

Monitoring pins will be installed to the face of the tunnel and all readings presented to the RESS/DRM each shift. These results may determine whether any additional support is required to the temporary face. If the tunnelling work is stopped for a period longer than 24hrs, the RESS/DRM will instruct the tunnel monitoring will be continued with one set of monitoring every 24hrs. In addition to the specified tunnel monitoring points, the RESS/DRM will also instruct the installation of automated monitoring at the face.

In an event where the face is left unsupported for longer than 4hrs, the excavated profile will be resurveyed in the Amburg model and the profile checked for movement.

### 6.2 THAMES WATER PROCEDURE

Two-weeks prior to the commencement of any works that will or could have an impact on Thames Water assets the Bean Tunnel team will contact Thames Water and obtain a ‘Permit to Work’ thus ensuring that Thames Water are aware of the works in the vicinity of their asset and that precautions have been agreed in advance to mitigate against damage, and where damage does occur a pre-determined plan is in place to mitigate the impacts thereof. Upon completion, the Bean Tunnel team will advise Thames Water that the works are complete and that no leaks have been detected.

In the event of damage, or suspected damage, to a Thames Water asset the Bean Tunnel team will contact the relevant Thames Water control centre as detailed in Section 4.1 and below:

In the event of damage, or suspected damage, to a **Wastewater Asset:**

**Thames Water Waste Operational Control Centre – 0800 009 3908**

In the event of damage, or suspected damage, to a **Clean Water Asset:**

**Thames Water Clean Water Network Management Centre – 0800 009 3909**

The Bean Tunnel team will contact the relevant number at the earliest available opportunity to allow Thames Water to isolate the service, identify the damage and agree a method of repair. During this period, works will cease until a repair has been agreed. As the damage, should it occur, will happen during tunnelling works the Evacuation Plan should be followed to ensure operatives are removed from the affected area as swiftly, and safely, as possible.

A confidential Thames Water 24-hour helpline (0800 030 8080) is available to all persons engaged in the project, and members of the public, in order to raise SSHE concerns. This number will be provided to all project staff and widely advertised. Balfour Beatty will treat any incident reported via the Thames Water helpline as a Level 3 incident in the first instance.

### 6.3 WORKING WITH EMERGENCY SERVICES & STATUTORY UNDERTAKERS

Depending on the type of incident or emergency, the ERT will need to work closely with the Emergency Services and relevant Statutory Undertakers. The extent of involvement with these services will depend on the situations for which they have responsibility and will vary according to the circumstances and the capability of the service.

Regular meetings between the Bean Tunnel project team and Fire/Ambulance services to liaise, discuss and review the requirements of the Fire and Rescue Service Operational Guidance for Incidents in Tunnels and Underground Structures. The Bean Tunnel team will also liaise with the Emergency Services to practice emergency scenarios regularly during the project. Where required, the Emergency Services will be supported by the ERT – this will depend on the nature of the incident and will be directed by the Emergency Services.

Where an emergency, or incident, is related to utilities the ERT will work with the relevant Statutory Undertake to contain and make safe any damage to their assets.

### 6.4 EMERGENCY/INCIDENT CONTROL PROCEDURE

The PIC is responsible for the assessment of the nature and extent of the incident. They are authorised to direct personnel and take immediate actions as necessary to ensure the safety of those in the area. The PIC will be in constant communication with the MIC who will be located at the surface.

The MIC is responsible for making an initial assessment of the nature and extent of the incident or emergency at site level. They are authorised to direct project personnel to take any immediate actions in respect of the incident or emergency, order area or zoned evacuations and seek assistance from appropriate persons, or agencies as necessary.

The MIC will remain in control of local operations, materials and equipment, the movement of persons including those of subcontractors, third parties and members of the public who are at immediate risk, until such a time as a representative of an Emergency Service formally takes control of the procedure, or more senior Bean Tunnel manager arrives.

A formal handover meeting will be undertaken prior to the MIC handing over responsibilities. The MIC will arrange to brief the Emergency Services representative on actions already initiated, advise on persons involved, or identified as missing and arrange assistance as required.

The MIC will contact the Project Emergency Coordinator (NOTE – this position is assigned on a rota). The coordinator is responsible for the escalation of the incident to the relevant third parties

### 6.4.1 EMERGENCY CALL-OUT PROCEDURE

It is the responsibility of the first person on the scene of an incident/emergency to take positive action to address the situation without endangering their life, or that of others. This person must inform the PIC to initiate the emergency call-out procedure. The PIC will then contact the MIC by the quickest means possible (i.e. mobile phone, or tunnel telephone).

On receipt of an emergency call, the MIC will ask the caller:

- To describe the incident and its location (Tunnel chainage required)
- What internal or external assistance in immediately required
- Whether any persons have been harmed or are seriously injured
- Whether the Emergency Services and/or the ERT have been called
- If NO, call the Emergency Services immediately

### 6.4.2 EMERGENCY ROLL CALL PROCEDURE

When an emergency evacuation of the site, tunnel, or shaft has been initiated all personnel must leave the affected area or zone as designated by the MIC and assemble at the nominated assembly point(s). Eucalyptus oil shall be introduced to the ventilation system from the tunnel entrance to alert the tunnel workers to commence an evacuation.

The MIC, or nominated person, shall take a roll call from the daily site records for the evacuated area(s) or otherwise ascertain that the area is clear of all personnel. A list of any missing persons will be handed to the lead Emergency Service representative attending the incident.

### 6.4.3 EMERGENCY EQUIPMENT

The type of emergency equipment available on site and where it is located will be briefed to all site personnel at the project site induction. The list of emergency equipment to be provided on the project is included in the Construction Phase Plan.

Emergency access/egress routes and emergency facilities are to be clearly displayed throughout site on notice boards, so they are visible to all site staff. A ‘Premises Information Box’ and ‘Emergency Grab Box’ will also be available on site. The Emergency Grab Box will include:

- Up to date hydrant & drainage plans
- Access/egress routes for emergency vehicles
- Location of firefighting, first aid and emergency equipment
- Location of spill kits
- Location of emergency controls for mechanical and electrical equipment

**Local A&E Hospital:**

Darent Valley Hospital, Darenth Wood Rd, Dartford, DA2 8DA

## 6.5 INCIDENT MANAGEMENT PROCEDURES

### 6.5.1 CONSTRUCTION EQUIPMENT

Any person discovering an emergency/incident involving plant/equipment must:

- Without endangering their life, or that of others, ascertain if any person is injured
- Contact the Duty Manager to provide details of the emergency/incident. Duty Manager to contact MIC as required.
- MIC or nominated person must ensure that the occurrence is investigated, and photographs are taken before the plant/equipment in question are removed

### 6.5.2 TUNNEL FLOOR ACCIDENT

Lead Miner (PIC) must:

- Stop construction work immediately and ensure injured person(s) is safely removed from the tunnel. Once out of the tunnel, first aid can be administered
- Remove appropriate entrance tag from the tally board as personnel exit the tunnel
- Record the emergency/incident in the accident book and investigate appropriately

### 6.5.3 GAS MONITOR ALARM ACTIVATED

A Red/Amber/Green monitoring system is in place, which is linked to the Trolex monitoring station in the tally hut and traffic light at the tunnel entrance:

- Green – All OK
- Amber – Gas level rising. Be aware. Tunnel workforce will be alerted to the amber status
- Red – Gas alarm activities. Evacuate tunnel, all personnel to evacuate in line with Evacuation Procedure

Once evacuated, the PIC will evaluate the reason for the monitor alarm being triggered and respond accordingly.

### 6.5.4 TUNNEL AND/OR EXCAVATION COLLAPSE

In the event of a tunnel and/or excavation collapse, the MIC must:

- Contact Emergency Services immediately
- Stop all tunnelling works
- Contact Project Emergency Coordinator, who will escalate the incident details as per the escalation procedure
- Reviews relevant utility drawings and notifies respective Statutory Undertakers accordingly

### 6.5.5 UNEXPLODED ORDNANCE

In the event that a potential unexploded ordnance (pUXO) is identified, the person discovering the pUXO will:

- Stop work immediately
- Not take any risks in assessing the object
- Not disturb the object in any way
- Inform the Shift Manager/Foreman/Supervisor immediately

The PIC will, without creating additional risks, then:

- Verify the location and nature of the object, if safe to do so
- Contact the MIC who will instigate the emergency procedure
- Stop all work on site and evacuate the area to the Assembly Point as directed by the MIC

The MIC will then contact the Emergency Services and Project Manager

### 6.5.6 FLOOD EVENT CONTINGENCY PLAN

The ensure preparedness for a flood event, the Bean Tunnel team will:

- Review and monitor weather forecasts and flood warning during construction
- Subscribe to the Environment Agency Floodline Warnings Direct service. This is the Environment Agency's free service to provide flood warnings by phone, test or email. Instructions on registration are available on the EA website:

https://fwd.environmentagency.gov.uk/app/olr/register

- Access Met Office weather warning system to follow predictions. Detail of this can be found through the below link:

http://www.metoffice.gov.uk/weather/uk/guide/warnings.html

- Take immediate action, if a flood warning is received, to ensure the safety of those working in the tunnel. This will include the installation of temporary flood defences to prevent water ingress to the tunnel. Sand bags will be available at all times which are to be deployed in the event that flood defences are damaged
- Complete a daily assessment of the flood risk depending on the activity. Where a risk is identified, the evacuation plan will be briefed to the workforce and muster points identified.

### 6.5.7 TOXIC OR CONTAMINATION INCIDENT

On discovering a toxic or contamination incident, the person who discovers the incident will:

- Notify those in the immediate vicinity of the incident by using the fire alarm system
- Ascertain whether anyone is injured or at risk of injury, without endangering their own life or others around them
- Safely determine the nature of the toxin/contaminant
- Instigate the emergency procedure outlined above if someone is injured
- Inform the Supervisor/Foreman who will assume responsibility for evacuating the site and instigating the roll-call procedure. The Supervisor/Foreman will also be responsible for making all site personnel aware of the toxin, considering wind speed and direction

In all instances, where a toxic/contaminant incident has occurred the project HSE Advisor should be contacted as soon as possible to initiate an investigation.

### 6.5.8 POWER OR VENTILATION FAILURE

In the event of a power failure that may result in or cause an emergency, the person discovering the incident should:

- Ascertain whether any persons are injured or may be affected, without putting their own life at risk
- Identify the location of the issue and initiate the emergency control procedure above.

# 7. EMERGENCY PREPAREDNESS PLAN REVIEW PROCEDURE

## 7.1 TESTING PROCEDURE

Testing of the EPP will form part of the internal audit programme, with testing of the included procedures undertaken on an annual basis and prior to any major work activities commencing, such as:

- Tunnel drives
- Start of significant new activities
- Significant extension of work site
- Significant change in methodology

The testing procedure may include:

- Trialling response to all types of incidents
- Planning exercises
- Desktop exercise
- Full incident simulations with Emergency Services

The annual site test of the emergency arrangements will include the Project Manager and any relevant enforcing authority. Any lessons learnt from the testing procedure will factor into the reviews conducted by the Project Manager.

## 7.2 REVIEW AND UPDATE POLICY

This EPP will be reviewed by the Project Manager on a six-monthly basis, or as required, to ensure it remains up to data and reflects the current construction methodology. The EPP will also be reviewed and updated based on learning from site activities or EPP testing, such as when:

- A recommendation is identified following an incident
- Significant changes to the work site or site conditions are identified
- A test situation identifies improvements